https://doi.org/10.46335/IJIES.2024.9.4.14 **e-ISSN: 2456-3463**
Vol. 9, No. 4, 2024, PP. 71--75
International Journal of Innovations in Engineering and Science, www.ijies.net

Literature Survey of Intelligent Irrigation

Vidya D. Pardeshi[1], Hemant T. Ingale[2], Shafique Ansari [3], Dr. Anil D. Vishwakarma[4], Rajendra V. Patil[5]

[1] PG Scholar, [2,3] Assistant Prof., [4,5] Asso. Professor
[1,2,3,4,5] Dept of E&TC Engg. MTech (VES), GF's Godavari COE Jalgaon -425001

vidyarajput282017@gmail.com[1], hetui@rediffmail.com[2], anil18vishwakarma@gmail.com[4]

***Received on**: 04 May,2024* ***Revised on**: 04 June,2024,* ***Published on**: 07 June ,2024*

Abstract—*Irrigation is the process of artificially supplying water to land where crops are cultivated. Traditionally hand pumps, canal water and rainfall were a major source of water supply for irrigation. This method has led to severe drawbacks like under irrigation, over-irrigation which in turn causes leaching and loss of nutrient content of soil. Changing environmental conditions and shortage of water have led to the need for a system which efficiently manages irrigation of fields. Automated irrigation system is a machine based system, which automates the irrigation of land by combining various software and hardware approaches together for field irrigation.*

Keywords*— *Automated Irrigation, Soil, leaching, nutrient

I. INTRODUCTION

Irrigation is a scientific process of artificially supplying water to the land or soil that is being cultivated. Traditionally in dry regions having no or little rainfall water had to be supplied to the fields either through canals or hand pumps, tube wells. But this method had severe problems such as increase in workload of farm labour and often it lead to problem such as over-irrigation or under-irrigation, and leaching of soil. Further there were issues like weeding, lesser yield of crop as an effect of above mentioned problems. Hence there was a need for a way to test the soil condition before supplying water to the fields. This mechanism would reduce the workload of the farmer and help maintain proper soil conditions for improved and better crop production. Hence with the advance of technology it was possible to design systems that eliminated the direct involvement of the farmer with respect to irrigation of their fields. These systems automated the entire irrigation system by controlling the motors that irrigated the fields. A GSM based farm irrigation system has two major technologies behind it, primary being the "GSM" and secondary one is the controller or processor. GSM (Global System for Mobile Communication) is a standard set used to describe protocols for digital cellular networks. This GSM facility serves as an important part for controlling the irrigation on field and sending the results to the farmer using coded signals to a mobile device which indirectly controls the entire farm irrigation system. The processor or the controller works as a central core for functioning of the automated process after it has been initiated by the GSM based device and finally presents the output to the device.

II DETAILED STUDY

An automated irrigation system was developed to optimize water use for agricultural crops. The system has a distributed wireless network of soil-moisture and temperature sensors placed in the root zone of the plants. A gateway unit handles sensor information, triggers actuators, and transmits data to a web application. An algorithm was developed with threshold values of temperature and soil moisture that was programmed into a microcontroller-based gateway to control water quantity. The system was powered by photovoltaic panels and had a duplex communication link based on a cellular-Internet interface that allowed for data

https://doi.org/10.46335/IJIES.2024.9.4.14 e-ISSN: 2456-3463
Vol. 9, No. 4, 2024, PP. 71--75
International Journal of Innovations in Engineering and Science, www.ijies.net

inspection and irrigation scheduling to be programmed through a web page. The automated system was tested in a sage crop field for 136 days and water savings of up to 90% compared with [1] traditional irrigation practices of the agricultural zone were achieved.

In this paper present a prototype for automatic controlling and remote accessing of irrigation motor. Prototype includes sensor node, controller node and mobile phone. In sensor node, soil moisture sensor and wireless transceiver is integrated with ARM cortex microcontroller. In controller node, GSM module, wireless transceiver, keypad, LCD display and a motor is integrated with ARM cortex microcontroller. The [2] sensor node can be deployed in irrigation field for sensing soil moisture and the sensed data is sent to controller node. On receiving sensor value the controller node checks it with required soil moisture value. When soil moisture in irrigation field is not up to the required level then the motor is switched on to irrigate associated agriculture field and alert message is send to registered mobile phone. Mobile phone can also be used for sending request SMS to get soil moisture information in irrigation field and commands can be sent as SMS to switch on/off the irrigation motor. The controller node has navigation keys to set the mode of operation and an LCD display to view sensor data. The prototype is tested by abstracting three pots containing soils with different moisture level as irrigation fields. Results show the proposed prototype is effective in automatic controlling and remote accessing of irrigation motor based on the feedback of soil moisture sensor and commands from mobile phone.

This paper aims in providing a user friendly, reliable and automated [3] water pumping system. The paper aims in designing a system which is capable of detecting moisture level in the soil and capable of taking the decision of switching ON/OFF water pump. The system also uses temperature sensor to detect the temperature and automatically the fan speed can be controlled like coolants. In this paper we make use of one microcontroller PIC16F72, which is dedicated at the water pump. The microcontroller forms the heart of the device and there are also soil-moisture sensors, which are meant - for detecting the moisture in the soil and is programmed with the proteus software. The system also uses temperature sensor based fan speed control system using DC fan. The proposed technique can help in reducing deaths of people due to current shocks at fields and also to on/off the motor automatically by using soil moisture sensors at fields which avoids the need of a human being.

In this paper, the Design [4] of Intelligent Drip Irrigation system for the Automation of Drip irrigation is presented. Generally the Drip irrigation was named in Israel in 1959. Drip Irrigation is today's need because water is nature's gift to the mankind and it is not unlimited and free forever. World's water resources are fastly vanishing. The one and only one solution to this problem is Intelligent Drip Irrigation system. In the conventional drip irrigation system, the farmer has to keep watch on irrigation timetable, which is different for different crops. In Intelligent Drip Irrigation using Linear Programming irrigation will take place only when there will be intense requirement of water. Irrigation system uses valves to turn irrigation ON and OFF. These valves may be easily automated by using controllers and solenoids. The developed irrigation method removes the need for workmanship for flooding irrigation as well as drip irrigation. This allows the farmer to apply the right amount of water at the right time, regardless of the availability of the labour to turn valves or motor ON & OFF. In this presented Intelligent Irrigation system I have used linear programming concept. Linear Programming helps us to distribute available water to the number of crops in order to get maximum profit with minimum cost. Also linear Programming helps us to do proper management of available water. Finally it helps to increase productivity and ultimately profit.

India is an agricultural country and agriculture is backbone of Indian economy. Agriculture provides the principal means of livelihood for the major Indian population. The optimum use of agriculture resources can lead to a good crop yield. Water resource is major constrain in agriculture so efficient distribution of available water is certainly beneficial to get good crop yield and hence profit. The sensor based irrigation system is able to provide optimum solution by continuously monitoring the parameters like, soil temperature, soil moisture air temperature, wind direction, wind speed. The proposed system consists of sensors placed in the farm area, a control station and a base station. Wireless sensor network (WSN) uses ad-hoc networks which support flexibility and self-configuration which is beneficial for agricultural application. Data acquired from different sensors is provided to the base station by wireless transmission using Zigbee. Once the data are received at the base station, further data processing and computation requirements for decision making are carried out by using data mining algorithm. The result of data processing and computations are utilized for controlling automated drip irrigation system. Data processing provides all real time data in the integrated form and generates information or observations in formats that are convenient for farmers or to other end users and this data is transmitted for web applications so that observations can be remotely monitored. When real time data is delivered, farmers are able to achieve intelligent crop irrigation system. [5] Hence such enhanced automation for irrigation provides a good electric & water conservation with more efficiency.

In last few decades, electronics and communication have become an integral part of our lives, always expanding into new realms, to provide ways to do things in precise manner. With the recent developments in wireless networks especially regarding power requirements and cost, it has become possible to conceive a comprehensive model for precision agriculture. In this paper we present

a closed loop automatic irrigation system along with the temperature and water usage monitoring. The system can be used in greenhouses as well as open fields. The real time values of soil moisture, temperature (useful in greenhouse cultivation) are wirelessly transmitted using Zigbee technology from field to substation which controls the state of the motor and irrigation valves according to the desired moisture levels set by the user. A flow sensor is also interfaced to the main [6] water supply which continuously tracks the water applied to the field. All the information viz. temperature, current soil moisture level in field, upper and lower moisture levels to be maintained in field (set by user), motor status, water usage and flow rate are displayed on LCD.

In the field of agriculture the most important part is: firstly, to get the information about the fertility of soil and secondly moisture content of soil. After measuring these two factors a farmer can start sowing of seeds. In this paper we are giving the brief outline about different techniques to measure soil fertility in order to check the productivity of crop. We are using here two devices to measure the constituents (potassium, phosphorus, nitrogen) of soil. After measuring fertility, we [7] are proposing a system of automatic drip irrigation through microprocessor to measure the moisture of soil.

Drip irrigation is now a common phenomenon gaining popularity especially in the states like Rajasthan where water scarcity is a day to day affair. For drip irrigation a small overhead water tank in used which supply water to the drip system. Usually the geographic systems as well as the cost do not permit a bigger tank. [8] This tank generally gets vacated and a farmer needs to be always attentive to refill the overhead tank from his well or cannel by an electric pump, mostly this need arises in the night as the availability of power is not whole day. This involved a lot of risk and cost on the part of farmer. The simple and low cost gadget that has been work upon, not only control the starting and stopping of motor by sending a simple SMS through a GSM mobile but also gets the return SMS showing level of water in overhead tank. The application of the gadget is not only limited to the use for a farmer & but can be beneficial for any process industry in which level of a chemical or any liquid need to be crucially controlled and monitored from far end, may be even from the home of a supervisor with no constraints of time or place for controlling the operations.

Irrigation is the artificial application of water to the land or soil. [9] It is used to assist in the growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Irrigation system uses valves to turn irrigation ON and OFF. These valves may be easily automated by using controllers and solenoids. In this project an attempt has been made to automate farm or nursery irrigation that allows farmers to apply the right amount of water at the right time, regardless of the availability of labour to turn valves on and off. In addition, farmers using automation equipment are able to reduce runoff from over watering saturated soils, avoid irrigating at the wrong time of day, which will improve crop performance by ensuring adequate water and nutrients when needed. The Microcontroller based automated irrigation system consists of moisture sensors, analog to digital converter, microcontroller, relay driver, solenoid valve, solar panel and a battery. This system can be used in the areas where electrical power is difficult to obtain. This system is eco-friendly and it uses a renewable source of energy.

Irrigation by help of freshwater resources in agricultural areas has a crucial importance. Because of highly increasing demand for freshwater, optimal usage of water resources has been provided with greater extent by automation technology and its apparatus such as solar power, drip irrigation, sensors and remote control. Traditional instrumentation based on discrete and wired solutions, presents many difficulties on measuring and control systems especially over the large geographical areas. This paper describes an application of a wireless sensor network for low-cost wireless controlled irrigation solution and real time monitoring of water content of soil. Data acquisition is performed by using solar powered wireless acquisition stations for the purpose of control [10] of valves for irrigation. The designed system has 3 units namely: base station unit (BSU), valve unit (VU) and sensor unit (SU). The obtained irrigation system not only prevents the moisture stress of trees and salification, but also provides an efficient use of fresh water resource. In addition, the developed irrigation method removes the need for workmanship for flooding irrigation. The designed system was applied to an area of 8 decrees in a venue located in central Anatolia for controlling drip irrigation of dwarf cherry trees.

The greenhouse based modern agriculture industries [11] are the recent requirement in every part of agriculture in India. In this technology, the humidity and temperature of plants are precisely controlled. Due to the variable atmospheric circumstances these conditions sometimes may vary from place to place in large farmhouse, which makes very difficult to maintain the uniformity at all the places in the farmhouse manually. It is observed that for the first time an android phone-control the Irrigation system, which could give the facilities of maintaining uniform environmental conditions are proposed. The Android Software Development Kit provides the tools and Application Programmable Interface necessary to begin developing applications on the Android platform using the Java programming language. Mobile phones have almost become an integral part of human life serving multiple needs of humans. This application makes use of the GPRS [General Packet Radio Service] feature of mobile phone as a solution for irrigation control system. GSM (Global System for Mobile Communication) is used to inform the user about the exact field condition. The

information is passed onto the user request in the form of SMS.

The green house based modern agriculture industries are the recent requirement in every part of agriculture in India. In this technology, the humidity and temperature of plants are precisely controlled. Due to the variable atmospheric [12] conditions sometimes may vary from place to place in large farmhouse, which makes very difficult to maintain the uniformity at all the places in the farmhouse manually .The proposed system implemented GSM is used to report the detailed about irrigation. The report from the GSM is send through the android mobile. The Keil software is used for simulated the result.

Drip Irrigation is today's need because water is nature's gift to the mankind and it is not unlimited and free forever. World's water resources are fastly vanishing. The one and only one solution to this problem is automated Drip Irrigation system. In the field of agriculture, use of proper method of irrigation is important and it is well known that irrigation by drip is very economical and efficient. In the conventional drip irrigation system, the farmer has to keep watch on irrigation timetable, [13] which is different for different crops. In Automatic microcontroller based drip irrigation system irrigation will take place only when there will be intense requirement of water. Irrigation system uses valves to turn irrigation ON and OFF. These valves may be easily automated by using controllers and solenoids. The purpose of this paper is to provide more facility in agriculture field by using wireless sensor network along with linear programming. Paper describes an application of a wireless sensor network for low-cost wireless controlled and monitored irrigation.

In many parts of the world especially in arid and semi-arid areas, rainfalls, due to their seasonal nature, are inadequate to meet agricultural needs. It thus becomes imperative to use irrigation to meet the moisture needs of plants in order to increase food crop production. The system described here monitors the moisture needs of crops through buried sensors and automatically pumps water for irrigation when the need arises. Through the use of a microcontroller and sensors, water storage and delivery to the farm are automatically carried out thus requiring minimal human interventions, achieving supply of water as needed by plants thus optimizing plant growth and helping to [14] conserve water and energy. The system is very simple to operate and ideally suits the irrigation need of rural farmers.

In past couple of decades, there is immediate growth in field of agricultural technology. Utilization of proper method of irrigation by drip is very reasonable and proficient. A various drip irrigation methods have been proposed, but they have been found to be very luxurious and dense to use. [15] The farmer has to maintain watch on irrigation schedule in the conventional drip irrigation system, which is different for different types of crops. In remotely monitored embedded system for irrigation purposes have become a new essential for farmer to accumulate his energy, time and money and will take place only when there will be requirement of water. In this approach, the soil test for chemical constituents, water content, and salinity and fertilizer requirement data collected by wireless and processed for better drip irrigation plan. This paper reviews different monitoring systems and proposes an automatic monitoring system model using Wireless Sensor Network (WSN) which helps the farmer to improve the yield.

In this part of research he has developed a system [16] which will tackle part of the problem by trying to improve the efficiency of water use in irrigation systems which include the design of decision support software and its integration with an in-field wireless sensor network to implement water pumping irrigation control via Zig bee Technology In our system we have tried to automate the water pumping system to pump the water whenever the prescribed water level or humidity of the soil goes down below prescribed threshold for which water level sensor & Humidity sensor has been taken into account . If the water level is increased beyond the prescribed level during rain or flood, our system automatically lets the extra water and recycles them back to the water tank. Our system also senses the wind speed to predict any storm, other natural calamities and warns the farmer by sending him an SMS using a GSM Technology. For safety purpose we also have fire and temperature sensors to alert the farmer on any kind of such eventualities. The prescribed water level for a crop varies depending on different crops and nature of the soil, so we have developed a user interface to feed the type of soil and crop to automatically set the water level. The farmer is able to control and monitor the field using his PC which is connected to the control system via Zig bee in this situation the web interface provides an excellent platform from which to develop the system. The portability of this technology means that the system could be controlled from anywhere in the world.

III CONCLUSION

There is an urgent need for a system that makes the agricultural process easier and burden free from the farmer's side. With the recent advancement of technology it has become necessary to increase the annual crop production output of our country India, an entirely agro-centric economy. The ability to conserve the natural resources as well as giving a splendid boost to the production of the crops is one of the main aims of incorporating such technology into the agricultural domain of the country. To save farmer's effort, water and time has been the most important consideration. Hence systems need to be designed to provide this ability efficiently using wireless sensor networking, sprinkler irrigation, GSM, SMS technology, Bluetooth technology and readily available mobile phone devices is a certain help to the farmers to get better yield on a large scale and thereby increasing the agricultural wealth and the economic growth of our country.

REFERENCES

[1] *Joaquín Gutiérrez, Juan Francisco Villa-Medina "Automated Irrigation System Using a Wireless Sensor Network and GPRS Module" IEEE Transactions on Instrumentation And Measurement*

[2] *R. Jaichandran, A. Anthony Irudhayaraj "Prototype for Automatic Controlling and Remote Accessing of Irrigation Motor" International Journal of Innovative Research in Computer and Communication Engineering Vol. 1, Issue 4, June 2013*

[3] *Swati Devabhaktuni, D.V.Pushpa Latha "Soil Moisture and Temperature sensor based intelligent irrigation water pump controlling system using PIC 16F72 Microcontroller" International Journal of Emerging Trends in Engineering and Development Issue 3, Vol.4 (June-July 2013)*

[4] *Dnyaneshwar Natha Wavhal, Manish Giri "Intelligent Drip Irrigation System" International Journal of Engineering Sciences & Research Technology*

[5] *Jyotsna Raut, V. B. Shere "Automatic Drip Irrigation System using Wireless Sensor Network and Data Mining Algorithm" International Journal of Electronics Communication and Computer Engineering Volume 5, Issue (4) July, Technovision-2014, ISSN 2249–071X*

[6] *Neelam R. Prakash, Dilip Kumar, Tejender Sheoran "Microcontroller Based Closed Loop Automatic Irrigation System" International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-1, Issue-1, June 2012*

[7] *Rashid Hussain, JL Sahgal, Anshulgangwar "Control of Irrigation Automatically By Using Wireless Sensor Network" International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-3, Issue-1, March 2013*

[8] *Deepak Gupta, Amit Kushwaha "Precesion Agriculture for Drip Irrigation Using Microcontroller and GSM Technology" Int. Journal of Engineering Research and Applications ISSN : 2248-9622, Vol. 4, Issue 6 (Version 5), June 2014, pp.229-233*

[9] *Shiraz Pasha B.R., B. Yogesha "Microcontroller Based Automated Irrigation System" The International Journal of Engineering and Science (IJES)*

[10] *Mahir Dursun, Semih Ozden "A wireless application of drip irrigation automation supported by soil moisture sensors" Scientific Research and Essays Vol. 6(7), pp. 1573-1582, 4 April, 2011*

[11] *Pavithra D. S., M. S .Srinath "GSM based Automatic Irrigation Control System for Efficient Use of Resources and Crop Planning by Using an Android Mobile" IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 11, Issue 4 Ver. I (Jul- Aug. 2014)*

[12] *R. suresh , S .Gopinath, K .Govindaraju "GSM based A utomated Irrigation Control using Raingun Irrigation System" International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 2, February 2014*

[13] *Manish Giri, Dnyaneshwar Natha Wavhal "Automated Intelligent Wireless Drip Irrigation Using Linear Programming" International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 2, Issue 1, January 2013*

[14] *Jonathan A. Enokela, Isaiah I. Tsavwua "The Implementationof a Control Circuit for a MicrocontrollerBased Automated Irrigation System" International Journal of Emerging Technology and Advanced Engineering*

[15] *Aniket H. Hade, Dr. M.K. Sengupta "Automatic Control of Drip Irrigation System & Monitoring Of Soil by Wireless" IOSR Journal of Agriculture and Veterinary Science*

[16] *Lewis Ndaro, Wang Liqiang "Zig Bee Technology and Sensor Network in*

[17] *Irrigation Control Monitoring System" International Journal of Science and Research (IJSR).*